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OF AQUATIC RESOURCES AND ECONOMIC ALTERNATIVES**



Leatherback turtles nesting at Chiriquí Beach, Panama

# USAID PROGRAM FOR THE MANAGEMENT OF AQUATIC RESOURCES AND ECONOMIC ALTERNATIVES

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# SEA TURTLE PROTECTION FINAL REPORT

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## LIST OF ACRONYMS

ANABOCA	Bocas Hawksbill Association ( <i>Asociación Natural Bocas Carey</i> )
ANAM	National Environment Authority ( <i>Autoridad Nacional del Ambiente</i> )
APRORENANB	Association for the Protection of Ngöbe-Buglé Natural Resources ( <i>Asociación para la Protección de los Recursos Naturales Ngöbe-Buglé</i> )
ARAP	Authority of the Aquatic Resources of Panama ( <i>Autoridad de los Recursos Acuáticos de Panamá</i> )
STC	Sea Turtle Conservancy
STRI	Smithsonian Tropical Research Institute
USAID	United States Agency for International Development

## SUMMARY

The objective of this final report is to summarize the results of sea turtle monitoring and protection activities conducted by the Sea Turtle Conservancy (STC) in Bocas del Toro Province and the Comarca Ngöbe-Buglé, Panama, from 20 January – 31 October, 2012. These activities were part of the STC Task Order for year two of the USAID regional Program for the Management of Aquatic Resources and Economic Alternatives. It will update information previously detailed in the Sea Turtle Protection Progress Reports 1 – 3 submitted to USAID (USAID, 2012<sub>a</sub>; USAID, 2012<sub>b</sub>; USAID, 2012<sub>c</sub>).

## INTRODUCTION

As detailed in the ‘*Baseline Report on the Status of Sea Turtle Populations in the Bocas del Toro Province and the Comarca Ngöbe-Buglé, Panama*’ (USAID, 2010), the STC conducts sea turtle monitoring programs at Bluff Beach in Bocas del Toro province, and at Red Beach, Escudo de Veraguas Island and Chiriquí Beach in the Comarca Ngöbe-Buglé (See Figure 1).



Figure 1. STC project sites in Bocas del Toro Province and the Comarca Ngöbe-Buglé

Four species of sea turtles have been recorded in the region; leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), green turtle (*Chelonia mydas*) and loggerhead (*Caretta caretta*), and it contains important nesting, migration and foraging sites for various life stages of these different species.

Data collection is focused on hawksbill and leatherback populations, as these are the two most abundant species in the region; however, data on all sea turtle species encountered during monitoring activities are recorded.

Continuous, long-term monitoring activities are crucial to determine the status of nesting populations of sea turtle species in the area, and they provide valuable data to evaluate the effectiveness of any protection and conservation initiatives that are implemented.

The most significant threats to sea turtles within Bocas del Toro and the Comarca Ngöbe-Buglé are anthropogenic in nature, and include the illegal harvest of turtles at sea or on the nesting beach, predation of nests by domestic dogs (*Canis familiaris*), and potential tourism development at key nesting sites. STC has been working to reduce the impact of these threats, with particular emphasis on reducing dog predation at Chiriquí Beach; a globally important nesting beach for both leatherback and hawksbill turtles. In addition, collaboration with local communities and government authorities has aimed to decrease the levels of illegal take of turtles by fishers in coastal waters.

## METHODOLOGY

### Monitoring Activities

A detailed description of the monitoring protocol is provided in the '*Baseline Report on the Status of Sea Turtle Populations in the Bocas del Toro Province and the Comarca Ngöbe-Buglé, Panama*' (USAID, 2010); there follows a summary of the activities conducted during the timeframe of this report.

Track surveys of study beaches are conducted on foot to record all sea turtle nesting activity. All tracks are identified by species, and recorded as either a successful nesting attempt or a false crawl emergence. Any evidence of nest predation, illegal take of eggs and/or female turtles, or erosion by high tides is also noted. Survey frequency varies at each site, depending on various conditions; however, there is daily monitoring at all beaches during the peak turtle nesting season.

During track surveys the location of all hawksbill nests is marked using flagging tapes in the vegetation behind the nest; the nests are located using triangulation from these reference tapes. For leatherbacks, if the turtle is encountered during the night patrol prior to laying her eggs, the location of the nest is marked using the same system of flagging tapes and triangulation. A GPS location is also recorded for each nest. All marked nests are monitored on subsequent surveys throughout the incubation period to record illegal take, predation or erosion events, and to record the date of hatching. Nest contents are excavated 2-3 days after hatching is observed, to determine hatching and emergence success.



Conducting monitoring activities at  
Escudo de Veraguas Island

STC beach monitors conduct nightly patrols to encounter nesting females at Chiriquí Beach, and members of the community organization ANABOCA (Bocas Hawksbill Association – *Asociación Natural Bocas Carey*) realize patrols at Bluff Beach from March thru October.

### Protection Measures

Various methods to protect sea turtle and their critical habitats in Bocas del Toro and the Comarca were described in the '*Work Plan for the Protection of Sea Turtles in the Bocas del Toro Province and the Comarca Ngöbe-Buglé, Panama*' (USAID, 2011).



A hawksbill nest that has been protected with plastic mesh to prevent dog predation

At Chiriquí Beach, hawksbill nests that were laid in areas known to be particularly vulnerable to dog predation were protected using plastic mesh ‘cages’, to physically prevent dogs from excavating eggs. It was not possible to use this direct protection method for leatherback nests due to the fact that nests made by this species are very large, and the eggs are buried very deep, and so it is not feasible to search for the egg chamber within the large nest site the following morning. In comparison, hawksbill nests are very small, and the eggs are quite shallow, and hence it is relatively easily to locate the egg chamber

to place the protective mesh cage the day after the turtle has laid the nest.

In addition, STC staff held meetings with Comarca leaders to solicit support in encouraging dog owners to control their dogs during turtle nesting and hatching season. The Field Assistant and beach monitors also spoke directly to the owners of dogs that had been observed predating turtle nests on the beach; asking them to tether their animals during nesting season, and providing collars and chains where necessary.

The government enforcement agencies (ANAM and ANAM Comarcal) were responsible for enforcing laws pertaining to sea turtles and their habitats with the Comarca Ngöbe-Buglé and Bocas del Toro Province.



## RESULTS AND DISCUSSION

### Monitoring Activities

At Chiriquí Beach a total of 265 track surveys were conducted from January thru October. Monitoring began at Bluff Beach in February; 255 surveys were realized. Escudo de Veraguas Island and Red Beach were surveyed between April and October; 150 and 163 track surveys were conducted, respectively. Table 1 summarizes the data from track surveys conducted at all four study sites.

Leatherback nesting activity was observed from January to August, with a peak in May at both Chiriquí Beach and Bluff Beach (See Figure 2); sporadic leatherback nesting was observed at Escudo de Veraguas Island and Red Beach (See Table 1). The 2012 nesting season was higher than the previous two years at Chiriquí Beach.

**Table 1. Summary of track survey data, January – October 2012**

Site	Chiriquí Beach				Bluff Beach			
Species	Leatherback		Hawksbill		Leatherback		Hawksbill	
Month	Nest	False crawl	Nest	False crawl	Nest	False crawl	Nest	False crawl
Jan	0	0	0	0	N/S	N/S	N/S	N/S
Feb	55	0	2	1	2	1	0	0
Mar	211	9	2	0	6	2	0	0
Apr	1,931	218	20	5	79	97	7	3
May	2,203	242	106	16	97	61	20	15
Jun	970	81	248	36	62	52	24	18
Jul	127	23	246	67	7	5	21	24
Aug	2	1	222	37	1	0	14	6
Sept	0	0	139	16	0	0	13	9
Oct	0	0	60	17	0	0	11	3
<b>TOTAL</b>	<b>6,225</b>	<b>638</b>	<b>1,056</b>	<b>198</b>	<b>281</b>	<b>235</b>	<b>110</b>	<b>78</b>

N/S = No surveys conducted at the site in that month



Site	Escudo de Veraguas Island				Red Beach			
Species	Leatherback		Hawksbill		Leatherback		Hawksbill	
Month	Nest	False crawl	Nest	False crawl	Nest	False crawl	Nest	False crawl
<b>Apr</b>	1	0	2	0	9	0	1	0
<b>May</b>	0	0	1	0	5	0	14	2
<b>June</b>	1	0	94	0	0	0	24	0
<b>July</b>	0	0	92	3	0	0	14	3
<b>Aug</b>	1	0	88	7	0	0	22	9
<b>Sep</b>	0	0	38	0	0	0	21	7
<b>Oct</b>	0	0	23	2	0	0	7	1
<b>TOTAL</b>	<b>3</b>	<b>0</b>	<b>338</b>	<b>12</b>	<b>14</b>	<b>0</b>	<b>103</b>	<b>22</b>

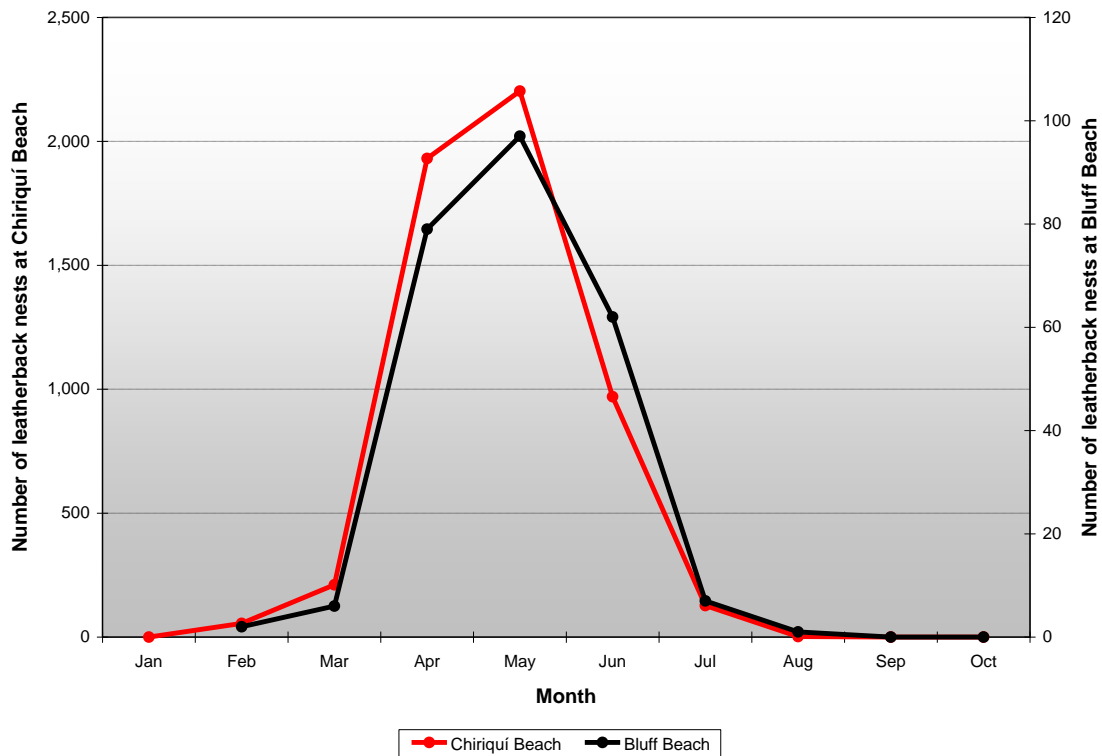


Figure 2. Leatherback nesting at Chiriquí Beach and Bluff Beach in 2012

Hawksbill nesting was recorded throughout the year from February onwards (See Table 1); peak nesting occurred in June for all sites (See Figure 3). Escudo de Veraguas Island and Red Beach continue to show increased levels of hawksbill nesting activity, and, when combined with data from Chiriquí Beach, make the Comarca Ngöbe-Buglé one of the most important hawksbill nesting sites in Central America and the Caribbean.

There were also 24 green turtle nests and four false crawls recorded during track surveys in July and August at Chiriquí Beach; at Bluff Beach 10 green turtle nests and six false crawls were observed. There was also one green turtle nest seen at Red Beach. This is the highest level of green turtle nesting that has been observed in the region for several years.

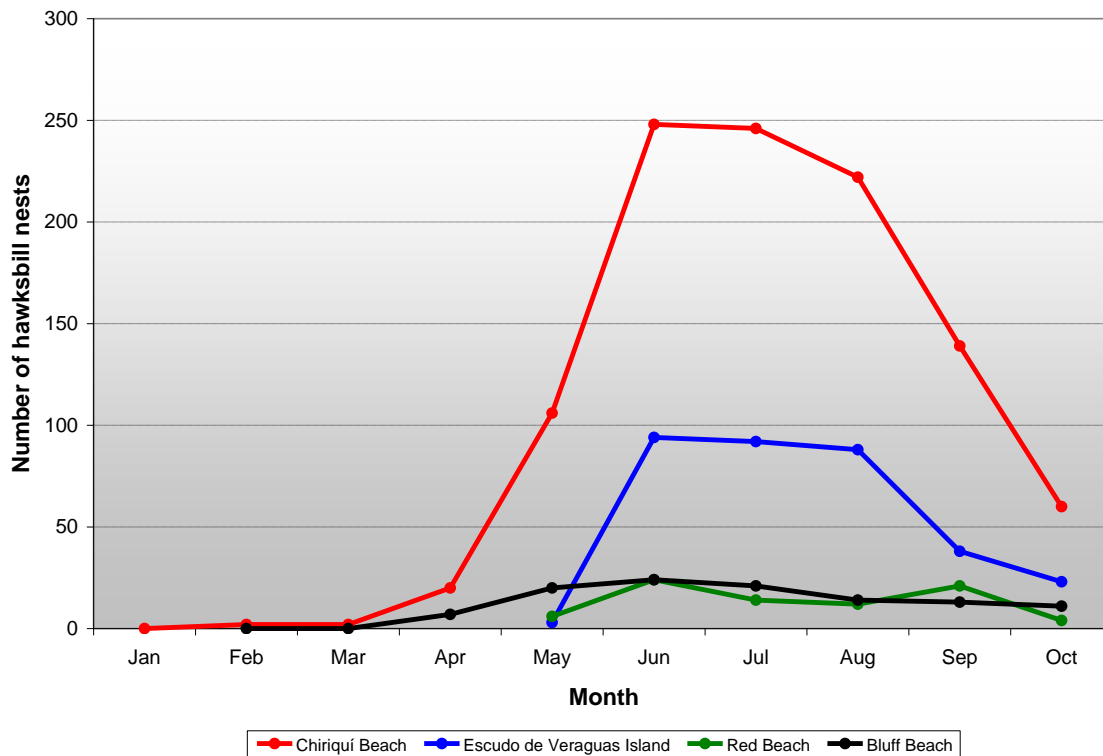


Figure 3. Hawksbill nesting at project study sites in 2012

Table 2 summarizes turtle encounters recorded during night patrols at Chiriquí Beach and Bluff Beach; at both sites daily night patrols were conducted from June thru October. There were many nights at Chiriquí Beach when it was impossible to patrol the entire beach due to extensive erosion, which made it impossible to walk on certain stretches of the beach at night; only around half the beach could be patrolled at these times. In June there were also several nights when all night patrols had to be suspended for the security of the beach monitors, due to high tides that were reaching up to the vegetation. The high tides also affected night patrols at Bluff Beach throughout 2012; patrols were restricted to certain sections of the beach or were cancelled for safety reasons when necessary.

In July 2012, night patrols were also initiated at Red Beach to try and reduce the illegal killing of nesting hawksbills on the beach at night; patrols were conducted from July thru September. During these patrols beach monitors recorded 11 encounters; they were not trained to tag turtles, but would record tag numbers if present. Four of the 11 turtles observed were recaptures of turtles tagged previously at other nesting beaches in the Comarca.

**Table 2. Summary of turtles encountered during night patrols in 2012**

<b>Site</b>	<b>Chiriquí Beach</b>		<b>Bluff Beach</b>	
<b>Month</b>	<b>Leatherback</b>	<b>Hawksbill</b>	<b>Leatherback</b>	<b>Hawksbill</b>
<b>Mar</b>	128	1	34	0
<b>Apr</b>	314	2	88	3
<b>May</b>	344	14	81	12
<b>Jun</b>	172	30	46	18
<b>Jul</b>	19	39	1	8
<b>Aug</b>	0	39	0	6
<b>Sep</b>	0	18	0	2
<b>Oct</b>	0	6	0	0
<b>TOTAL</b>	<b>977</b>	<b>149</b>	<b>250</b>	<b>49</b>

From Tables 1 and 2 it can be seen that the percentage of encounters with nesting turtles was much higher at Bluff Beach than at Chiriquí Beach; this is due to the fact that the beach is much shorter, therefore patrol coverage was greater, thus increasing the probability of encountering any turtles. The entire 24 km at Chiriquí Beach cannot be patrolled each night; many nesting events are not observed during night patrols, but the nest is included in the track survey. In addition; there were two encounters with green turtles at Chiriquí Beach and four at Bluff Beach.

Table 3 provides a summary of nest survivorship at each of the study sites; including the number of poached, depredated and eroded nests.

**Table 3. Summary of nest survivorship in 2012**

<b>Site</b>	<b>Chiriquí Beach</b>		<b>Bluff Beach</b>		<b>EdV</b>		<b>Red Beach</b>		<b>TOTAL</b>	
<b>Fate</b>	<b>Dc</b>	<b>Ei</b>	<b>Dc</b>	<b>Ei</b>	<b>Dc</b>	<b>Ei</b>	<b>Dc</b>	<b>Ei</b>	<b>Dc</b>	<b>Ei</b>
<b>Poached</b>	0	8	2	14	0	0	0	4	<b>2</b>	<b>26</b>
<b>Depredated</b>	103	300	29	11	0	0	0	0	<b>132</b>	<b>311</b>
<b>Eroded</b>	185	19	27	5	0	5	0	3	<b>212</b>	<b>32</b>
<b>TOTAL</b>	<b>288</b>	<b>327</b>	<b>58</b>	<b>30</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>7</b>	<b>346</b>	<b>369</b>

EdV = Escudo de Veraguas Island; Dc = Leatherback; Ei = Hawksbill

There were only two leatherback nest reported as poached at the four study sites (at Bluff Beach); and there was an increase in the number of hawksbill nests that were taken ( $n = 26$ ), when compared to previous years. Bluff Beach had the highest level of poaching; 12.7% of all hawksbill nests laid were poached, despite monitors relocating nests that were deemed vulnerable. Unfortunately, there was also an increase in the number of females that were taken from the nesting beach; 22 turtles were taken in total, of which 14 (63.6%) were taken from Red Beach. These turtles were taken at the start of the nesting season; in an effort to reduce this level of mortality, night patrols were initiated in July, to deter people from going to the beach to look for turtles. The strategy proved successful, as no more turtles were taken after patrols began.

Erosion resulted in the loss of many nests at Chiriquí Beach and Bluff Beach; over 200 leatherback and more than 30 hawksbill nests were lost due to high tides. For leatherbacks the problem was most severe in March and April (at the start of the season); there were days when patrols were suspended due to the high tides that made it dangerous to walk on some sections of beach. Another period of high tides was observed in the middle of the year (June – August); this was when the majority of hawksbill nests were lost at Chiriquí Beach. In addition to the loss of nests through tidal erosion, there were also some nests that did not emerge because they were inundated by the high tides.

Once again, at Chiriquí Beach and Bluff Beach the greatest threat to hawksbill nest survival was predation by domestic dogs; 28.4% and 10.0% of nests were destroyed or partially destroyed by dogs at these two beaches, respectively. For leatherbacks this was also a significant problem; 1.7% and 10.3% of nests were reported as predated at Chiriquí Beach and Bluff Beach, respectively. At Chiriquí Beach, monitors continued the use of plastic mesh to protect eggs; however, due to the sheer number of nests laid it was not possible to protect 100% of them, and so protection efforts were focused on known predation ‘hotspots’. This protection method is discussed in more detail in the following section (Protection Measures).

From January thru October 2012 a total of 502 leatherback nests were excavated to evaluate hatching and emerging success; 455 at Chiriquí Beach and 47 at Bluff Beach. A summary of the excavation data are provided in Table 4.

Emerging and hatching success are both higher at Chiriquí Beach than at Bluff Beach (See Table 4). Overall emerging and hatching success, combining both sites and all nests, is low; just 18.8% and 17.5%, respectively. However, these values are obviously significantly affected by the inclusion of depredated and eroded nests, which have very low hatching or emerging success. Looking at *in situ* intact (ie. undisturbed) nests it is evident that nests laid at Chiriquí Beach have much higher success rates than those at Bluff Beach; Emerging success – 67.6% and 47.0%, respectively and Hatching success – 61.8% and 45.3%, respectively.

**Table 4. Summary of excavation data for leatherback nests in 2012**

<b>Site</b>	<b>Destiny of nest</b>	<b>Number of nests</b>	<b>Mean % emerging success</b>	<b>Mean % hatching success</b>	<b>Estimated number of hatchlings</b>
<b>CHB</b>	<i>In situ</i> Intact	342	67.6	61.8	16,618
	<i>In situ</i> Depredated	103	6.4	6.3	326
	<i>In situ</i> Eroded	10	0.0	0.0	0
<b>Sub-total CHB</b>		<b>455</b>	<b>24.7</b>	<b>22.5</b>	<b>16,944</b>
<b>BB</b>	<i>In situ</i> Intact	11	47.0	45.3	428
	<i>In situ</i> Depredated	2	24.9	22.7	41
	<i>In situ</i> Eroded	4	0.0	0.0	0
	Relocated <sup>1</sup> Intact	19	23.1	21.3	365
	Relocated <sup>1</sup> Depredated	6	0.0	0.0	16
	Relocated <sup>1</sup> Eroded	5	0.0	0.0	0
<b>Sub-total BB</b>		<b>47</b>	<b>15.8</b>	<b>14.9</b>	<b>850</b>
<b>TOTAL</b>		<b>502</b>	<b>18.8</b>	<b>17.5</b>	<b>17,794</b>

CHB = Chiriquí Beach; BB = Bluff Beach

<sup>1</sup>'Relocated' includes nests relocated on the beach

Predation reduces hatching success to only around 10% of that of intact nests at Chiriquí Beach; at Bluff Beach predation reduces hatching success by 50% (See Table 4). It is also interesting to note at Bluff Beach, that the success of intact relocated nests was less than half that of nests left *in situ*; thus suggesting that relocation should only be used as a last option, if it is deemed that the nest will be lost if left *in situ*. Some relocated nests were predated, and others were subject to tidal erosion; Bluff Beach is very dynamic and the site chosen for relocation needs careful consideration, to ensure that the possibility of it being eroded or predated is low, to effectively increase the survivorship and hatching success.

Obviously the number of hatchlings estimated to have been produced shown in Table 4 (17,794) is calculated from the 502 nests that were excavated; it does not take into consideration the other nests that were laid. However, using the data from Table 3 and the values for mean hatching success from Table 4, it is possible to make a very rudimentary estimation of the number of leatherback hatchlings produced at the four study sites in 2012; since it is known how many nests were laid, how many were lost through poaching, predation and erosion, and the effect of these impacts on hatching and emerging success. For Escudo de Veraguas Island and Red Beach values from Chiriquí Beach were used. **When these calculations were conducted the total estimated number of leatherback hatchlings produced is 300,875.**

From January thru October 2012 a total of 774 hawksbill nests were excavated to evaluate hatching and emerging success; 493 at Chiriquí Beach, 201 at Escudo de Veraguas Island, 47 at Red Beach and 33 at Bluff Beach. A summary of the excavation data are provided in Table 5.

**Table 5. Summary of excavation data for hawksbill nests in 2012**

Site	Destiny of nest	Number of nests	Mean % emerging success	Mean % hatching success	Estimated number of hatchlings
<b>CHB</b>	<i>In situ</i> Intact	183	58.5	54.1	15,272
	<i>In situ</i> Depredated	292	2.0	1.7	476
	<i>In situ</i> Eroded	7	0.0	0.0	0
	<i>In situ</i> With cage Intact	4	55.7	45.4	300
	<i>In situ</i> With cage Depredated	5	0.0	0.0	0
	<i>In situ</i> With cage Eroded	2	0.0	0.0	0
<b>Sub-total CHB</b>		<b>493</b>	<b>19.4</b>	<b>16.9</b>	<b>16,048</b>
<b>EdV</b>	<i>In situ</i> Intact	201	60.0	59.9	17,336

CHB = Chiriquí Beach; EdV = Escudo de Veraguas Island



**Table 5. Continued**

Site	Destiny of nest	Number of nests	Mean % emerging success	Mean % hatching success	Estimated number of hatchlings
<b>RB</b>	<i>In situ</i> Intact	43	80.1	66.9	5,032
	<i>In situ</i> Poached	1	0.0	0.0	0
	<i>In situ</i> Eroded	3	0.0	0.0	0
<b>Sub-total RB</b>		<b>47</b>	<b>26.7</b>	<b>22.3</b>	<b>5,032</b>
<b>BB</b>	<i>In situ</i> Intact	3	78.4	78.2	361
	<i>In situ</i> Depredated	7	0.0	0.0	0
	Relocated <sup>1</sup> Intact	19	37.0	33.0	1,045
	Relocated <sup>1</sup> Depredated	3	23.8	4.0	114
	Relocated <sup>1</sup> Eroded	1	0.0	0.0	0
<b>Sub-total BB</b>		<b>33</b>	<b>27.8</b>	<b>23.0</b>	<b>1,520</b>
<b>TOTAL</b>		<b>774</b>	<b>26.4</b>	<b>22.9</b>	<b>39,936</b>

RB = Red Beach; BB = Bluff Beach

<sup>1</sup>'Relocated' includes nests moved to the hatchery or relocated on the beach

Hatching success of *in situ* intact hawksbill nests ranged from 54.1% (Chiriquí Beach) to 78.2% (Bluff Beach); it was interesting to observe that all three of the beaches in the Comarca had a lower hatching success than Bluff Beach. At both Chiriquí Beach and Bluff Beach, depredation of nests by dogs significantly reduced hatching and emerging success; to less than 4.0%. Unfortunately, during 2012 there was a significant increase in the level of depredation of hawksbill nests, including some (n = 5) that had been protected with the plastic netting; this seriously affected the overall emerging and hatching success calculated (26.4% and 22.9%, respectively).

Intact relocated nests at Bluff Beach also showed a significantly lower hatching success than *in situ* nests (33.0% compared to 78.2%, respectively); as for leatherback nests, relocation, therefore, should only be considered as a last resort if it is very likely that the nest will be either poached or eroded.

The number of hawksbill hatchlings that were estimated to have been produced that is shown in Table 5 (39,936) was calculated from data from excavations; but it does not consider other nests that were laid. Again, as for leatherbacks, it was possible to use the data from Table 3 and the values for hatching success shown in Table 5 to make a crude estimation of the number of hawksbill hatchlings produced at the four study sites in 2012, up until the end of October; since it is known how many nests were laid, how many were lost through poaching, predation and erosion, and the effect of these impacts on hatching and emerging success. **The result of these calculations show that the total estimated number of hawksbill hatchlings produced is 104,088.**

### **Protection Measures**

A minimum of 30 plastic mesh cages were used to protect hawksbill nests at Chiriquí Beach from dog predation. Due to the high number of hawksbill nests laid in 2012 it was impossible to protect all of them; only those nests deemed to be located in a high risk predation area were protected. Unfortunately, the beach monitors occasionally neglected to record if a cage had been placed on the nest; hence why the number quoted is a minimum value; at the end of the season, when all nests have been excavated (when cages are encountered if not recorded previously) it will be possible to determine the actual figure.

It was observed that there was an increase in the number dogs on the beach in 2012, and despite efforts by the Field Coordinator and the beach monitors to engage dog owners and advise them of the negative impacts their animals were having on the survivorship and hatching success of sea turtles in the Comarca, there was limited cooperation to control dogs, or keep them off the beach during nesting and hatching season. STC will be dedicated in future years in finding a more viable solution to the problem of controlling domestic dogs on nesting beaches, as the current impacts are alarming, and seriously threaten the success of the conservation program to date if allowed to continue unabated. The focus will be on raising awareness of the negative impacts caused by dogs to sea turtle populations, through intensive outreach campaigns targeted in communities with a known dog control problem.

Unfortunately, despite repeated discussions with STC staff, the environmental enforcement agencies (ANAM and ANAM Comarcal) did not conduct any operations within the Comarca or Bocas del Toro Province during 2012; there appears to be a significant lack of interest from officials to enforce wildlife laws in the area. Hopefully if the Sea Turtle Conservation Plan (USAID, 2012<sub>d</sub>) can be implemented successfully in the future, there will be an institutional obligation for ANAM and ARAP to actively protect sea turtles, not only in the Comarca Ngöbe-Buglé, but throughout Bocas del Toro Province also.

### **Community Participation**

Throughout 2012, STC worked closely with coastal communities in the Comarca Ngöbe-Buglé and Bocas del Toro Province; all monitoring and conservation activities were

conducted by community members, and members of local community organizations such as ANABOCA and APRORONANB (Association for the Protection of Ngöbe-Buglé Natural Resources – *Asociación para la Protección de los Recursos Naturales Ngöbe-Buglé*).

At Chiriquí Beach, residents from the two communities at either extremity of the nesting beach (Río Caña and Río Chiriquí) were contracted as beach monitors. A total of 31 people were employed by STC in 2012 (See Appendix 1); including one field assistant, 22 beach monitors, six cooks, one security guard and one boat captain. Of these, seven (22.6%) were women; all of the cooks at Chiriquí Beach, and one of the beach monitors at Bluff Beach. The majority of these people were existing employees of STC, though there were new beach monitors contracted at several of the project sites throughout the course of the season. All new personnel received training from STC Research Coordinator (RC), Cristina Ordoñez, prior to participating in program activities at the nesting beach. The Field Assistant (FA), Genaro Castillo, assists the RC is overseeing the daily implementation of the monitoring program at study sites in the Comarc; the RC tries to visit each site at least once a month.



Training of beach monitors at Bluff Beach

In addition to the contracted personnel there were also eight community members who participated in monitoring activities at Chiriquí Beach (See Appendix 2); the majority were high school students from Río Caña who have an interest in gaining hands-on experience with sea turtles. These volunteers play a key role in the program; once trained they work alongside the regular beach monitors and their presence allows extra night patrols to be conducted, so increasing the number of encounters with nesting females over the course of the season. Indeed, all of the

beach monitors currently employed by STC at Chiriquí Beach participated as volunteers on the project for at least a year before they were hired, gaining valuable experience in species identification, nesting behavior and the monitoring protocol.

Escudo de Veraguas Island and Red Beach have a different monitoring protocol and so require fewer personnel to conduct program activities, because monitoring is carried out over a shorter time period during the year (May thru November). No night patrols are conducted at Escudo de Veraguas Island, but for the first time beach monitors conducted night patrols at Red Beach, from July onwards.

At Bluff Beach, all of the beach monitors were members of the local community conservation organization, ANABOCA; they received training at the start of the nesting season, and then were in regular contact with the RC to discuss any issues or problems that arose throughout the year.

## Education and Outreach Activities

In addition to the monitoring and conservation activities, STC also conducted numerous education and outreach events during 2012; the objective of which was to raise awareness among the various participating groups about sea turtles, their threats, and the importance of conservation initiatives in Bocas del Toro Province and the Comarca Ngöbe-Buglé. Examples of these activities include;



STC staff meeting with indigenous leaders from the Comarca Ngöbe-Buglé

- Meeting with leaders of the Comarca to discuss the continuity of the sea turtle monitoring and conservation project at Chiriquí Beach, Escudo de Veraguas Island and Red Beach.
- Conducting a beach clean-up with students from the Bluff Beach community; to highlight the impact of pollution to turtles and the nesting beach habitat.



Students from Bocas del Toro participate in a march to raise awareness about sea turtles

- Participation in a workshop organized by ARAP (Authority for Aquatic Resources of Panama – *Autoridad por los Recursos Acuáticos de Panamá*) to discuss an action plan for the protection of coastal and marine environments in Panama, with an emphasis on establishing a baseline on the status of sea turtles.
- Collaborating with the Smithsonian Tropical Research Institute (STRI) to conduct the 5<sup>th</sup> Environmental Fair in Bocas del Toro. STC staff organized a march for students and teachers through Bocas Town to raise support for conservation programs. Students from Bluff Beach school presented a short play focused on sea turtles in danger of extinction.
- Various invitations to present the findings of the STC sea turtle program to National Police officials; this was a joint initiative with STRI to maintain relevant public entities updated on research and conservation initiatives in Bocas del Toro Province.
- National Police officials decommissioned two adult green turtles (one male, one female); these turtles were relinquished to the STC RC, who tagged and released them.



National Police officials with two decommissioned green turtles

- Participation in the events organized for the visit of the US Ambassador to Bocas del Toro; specifically, STC staff and ANABOCA representatives talked about the sea turtle program at Bluff Beach, and the role of indigenous communities in turtle conservation efforts in the region.



STC staff and ANABOCA members meet the US Ambassador to Panama

- STC staff and beach monitors from the Comarca and Bluff Beach were invited to participate in the first Binational Sea Turtle Symposium; staff gave presentations about the various STC sea turtle projects conducted in Costa Rica and Panama.

## CONCLUSIONS

- 1 The standard monitoring protocol was implemented from January thru October, 2012; to record data for leatherback and hawksbill turtles at four study sites in Bocas del Toro province and the Comarca Ngöbe-Buglé.
- 2 The 2012 leatherback season was higher than the previous years; with 6,523 nests recorded at the four project sites.
- 3 Hawksbill nesting numbers (within the Comarca) were the highest reported since the start of project monitoring activities in 2003; over 1,000 hawksbill nests were reported at Chiriquí Beach alone, and 1,604 for the four nesting beaches.
- 4 Dog predation remained a serious threat to nest survivorship at Chiriquí Beach; 101 leatherback and 76 hawksbill nests were disturbed by domestic dogs.
- 5 Poaching levels were higher than in previous years; two leatherback and 24 hawksbill nests were taken. There was also a sharp increase in the number of turtles killed on the nesting beaches, especially at Red Beach.
- 6 Night patrols were initiated at Red Beach in July, to try and mitigate high levels of illegal take of nesting female turtles from the nesting beach.
- 7 A total of 300,875 leatherback and 104,086 hawksbill hatchlings were estimated to have been produced at the four study sites in 2012.
- 8 Thirty-one local community members were employed by the STC in 2012; in addition there were 10 volunteers involved in project activities at Chiriquí Beach and Bluff Beach.
- 9 Numerous education and outreach activities were conducted for stakeholder groups, including students, government authorities and Comarca leaders.

## RECOMMENDED NEXT STEPS

- The standard monitoring protocol will be implemented at all four study sites in the Bocas del Toro province and the Comarca Ngöbe-Buglé in future years, to determine nesting trends for leatherback and hawksbill populations, assess the principal threats to turtles, eggs and nesting beach habitat in the region, and evaluate the effectiveness of protection and conservation measures implemented.
- Continue to liaise with Comarca leaders, community residents and environmental authorities to reduce the negative impact of domestic dogs on sea turtle nests, particularly at Chiriquí Beach and Bluff Beach. This should include awareness campaigns to highlight the threat of dog predation of nests on the future survival of sea turtles in the area.
- STC will work with government agencies in the region to disseminate the results of the project and emphasize the importance of the area for sea turtles and emphasize the critical importance of improving protection efforts, such as marine patrols to deter illegal turtle fishing within the Comarca.



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## APPENDICES

### Appendix 1. list of indigenous community members employed by STC in 2012.

Name	Position	Gender	Employment history	
			Start date	End date
Genaro Castillo	Field Assistant CHB	Male	Jan 2012	Oct 2012
Maximo Baker	Beach Monitor CHB	Male	Jan 2012	Oct 2012
Martin Quintero	Beach Monitor CHB	Male	Jan 2012	Oct 2012
Celio Morales	Beach Monitor CHB	Male	Jan 2012	Oct 2012
Jesus Maria Tugri	Beach Monitor CHB	Male	Jan 2012	Apr 2012
Wilfreda Baker	Beach Monitor CHB	Male	May 2012	Oct 2012
Salvador Baker	Beach Monitor CHB	Male	May 2012	Oct 2012
Rogelio Serrano	Beach Monitor CHB	Male	Jan 2012	Oct 2012
Silverio Juarez	Beach Monitor CHB	Male	Jan 2012	Oct 2012
Benicio Abrego	Beach Monitor CHB	Male	Jan 2012	Oct 2012
Ruben Pineda	Beach Monitor CHB	Male	Mar 2012	Oct 2012
Mauricio Jose	Beach Monitor EdV	Male	Jun 2012	Oct 2012
Roberto Bernard	Beach Monitor RB	Male	Apr 2012	Oct 2012
Francisco Machado	Beach Monitor RB	Male	Jun 2012	Oct 2012
Fernando Machado	Beach Monitor RB	Male	Jul 2012	Sep 2012
Dionicio Beker	Boat Captain	Male	Jan 2012	Oct 2012
Fermina Baker	Cook CHB	Female	Feb 2012	Oct 2012
Angela Morales	Cook CHB	Female	Feb 2012	Oct 2012
Fermina Martinez	Cook CHB	Female	Feb 2012	Oct 2012
Luciana Abrego	Cook CHB	Female	Feb 2012	Oct 2012
Victoria Abrego	Cook CHB	Female	Feb 2012	Oct 2012
Viviana Morales	Cook CHB	Female	Mar 2012	Oct 2012
Edilio Smith	Security Guard CHB	Male	Feb 2012	Oct 2012
Alfred Martin	Beach Monitor BB	Male	Mar 2012	Oct 2012
Aneldo Martin	Beach Monitor BB	Male	Mar 2012	Oct 2012
Armando Santos	Beach Monitor BB	Male	Mar 2012	Jul 2012
Laurencio Choly	Beach Monitor BB	Male	Mar 2012	Mar 2012
Ronaldo Mendoza	Beach Monitor BB	Male	Mar 2012	Mar 2012
Marcelio Martin	Beach Monitor BB	Male	Mar 2012	Sep 2012
Samuel Lopez	Beach Monitor BB	Male	Apr 2012	Apr 2012
Dianilza Martin	Beach Monitor BB	Female	Jul 2012	Sep 2012

CHB = Chiriquí Beach; EdV = Escudo de Veraguas Island; RB = Red Beach; BB = Bluff Beach

**Appendix 2. List of volunteers participating in research and monitoring activities during 2012.**

Name	Position	Gender	Volunteer history	
			Start date	End date
Onesimo Pineda	Volunteer CHB	Male	Mar 2012	Sep 2012
Julian Abrego	Volunteer CHB	Male	Mar 2012	Sep 2012
Miguel Abrego	Volunteer CHB	Male	Mar 2012	Sep 2012
Abdiel Becker	Volunteer CHB	Male	Mar 2012	Sep 2012
Laurencio Morales	Volunteer CHB	Male	Mar 2012	Sep 2012
Cordencio Abrego	Volunteer CHB	Male	Mar 2012	Sep 2012
Olmedo Quintero	Volunteer CHB	Male	Mar 2012	Sep 2012
Ruperto Pablo	Volunteer BB	Male	Mar 2012	Sep 2012
Gabriel Martin	Volunteer BB	Male	Mar 2012	Sep 2012
Damian Bejarano	Volunteer BB	Male	Mar 2012	Jul 2012

CHB = Chiriquí Beach; BB = Bluff Beach